

ON A ZOOLOGICAL COLLECTING TOUR OF THE ISLANDS OFF JAFFNA *

BY

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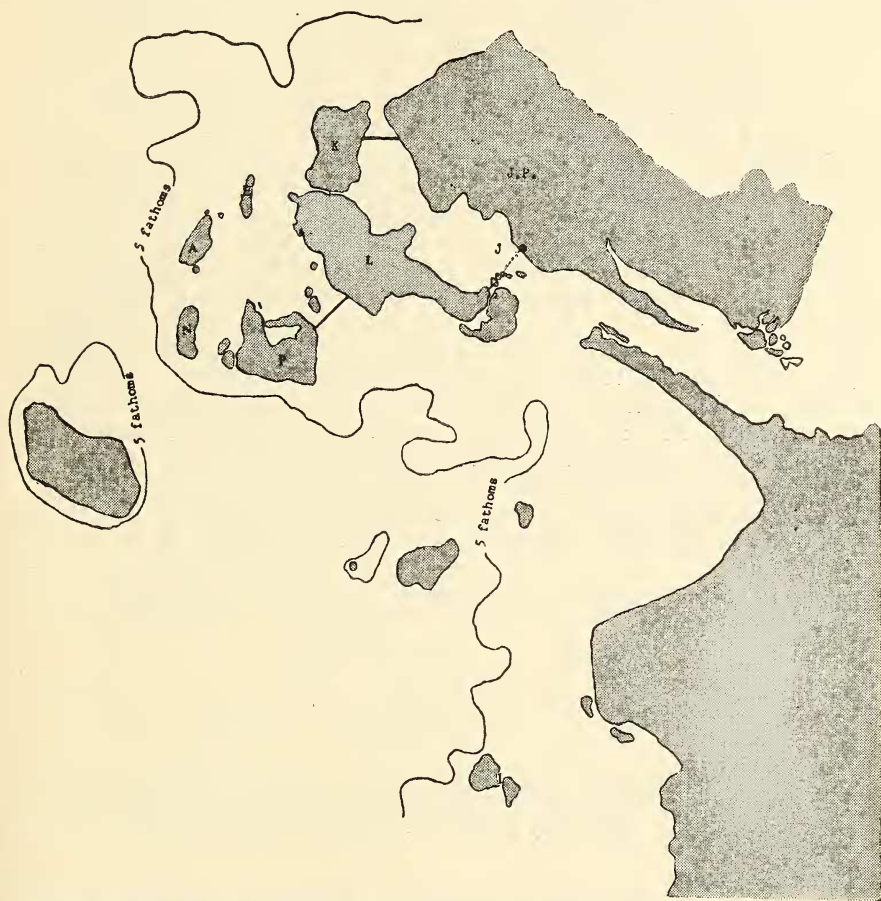
(*With a map*)

Lying to the west and south-west of Jaffna is a group of eight islands, namely Karaitivu, Leyden, Mandaitivu, Punkudutivu, Eluvativu, Anala-tivu, Nainativu, and Delft. Although a number of collecting tours had been undertaken from time to time to the island of Iranétivu, which lies about 12 miles to the south of Jaffna as the crow flies, no attention has been focussed on the fauna of the islands off Jaffna. It was decided, therefore, to make a preliminary survey of the fauna of these islands, and a tour of three weeks' duration was commenced during the second week of February this year (1956). Little attention was paid to the collection of marine fishes, but great emphasis was placed upon the collection of freshwater and land forms.

The islands closest to the mainland of Ceylon are Karaitivu, Leyden, and Mandaitivu, the first of which is Karaitivu. *Karaitivu* is situated at a distance of nearly two miles from the mainland and is almost nearly rectangular in shape. It measures nearly $4\frac{1}{2}$ miles in length and about three miles in width at its broadest region. It is much narrower at the middle. A two-mile causeway, the Punalai Causeway, connects it with the Jaffna Peninsula, whilst by ferry with the island of Leyden at Kayts. In the grey loamy soil region of the central, southern, and north-western areas paddy is cultivated, whilst palmyrah abound in the remaining sandy tracts of the island. The north-eastern and eastern shores of the island show patches of open country and marsh. The Island of *Leyden* lies nearly parallel to the western and south-western coasts of the Jaffna Peninsula. It is longer than broad, being nearly 15 miles in length and nearly $4\frac{1}{2}$ miles in breadth. It is connected with Karaitivu by ferry at Kayts and with Jaffna by ferry and causeway. Paddy cultivation is mainly centred in the grey loams of the central and northern areas of the island. The rest is sandy with sand dunes along the western shore, and open country on the eastern margin of the island. In the sand dune area palmyrah predominate, being replaced by thorny scrub and cacti in the open country. *Mandaitivu* is a comparatively small island lying at the southern extremity of the island of Leyden and connected to the latter by road. In some areas the soil is of the reddish variety, where tobacco cultivation is practised. The rest of the island is practically unsuitable for any cultivation. Both palmyrah and coco-nut are grown. The island of *Punkudutivu* is nearly square-shaped, lying to the south-west of Leyden and nearly 4 miles in length and about $3\frac{1}{2}$ miles in breadth. To its west lies the island of Nainativu and to its north-west

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the island of Eluvativu. Paddy cultivation is extensively practised in the grey loamy soil region, being replaced by the cultivation of cereals and palmyrah in the remaining sandy area. The northern shore is mainly open country, whilst there is a large area of marsh on the eastern shore. Punkudutivu is connected by a $2\frac{1}{2}$ mile causeway with the island of Leyden. At its south-western margin are two other small islands, Naduturititi and Kurikaduvan, the former being practically all marshy. *Eluvativu*, is a small island lying to the west of Kayts, at a distance of about $3\frac{1}{2}$ miles from Kayts as the crow flies. It is much longer than broad,



Scale: Quarter-inch=*ca.* 2.5 miles.

Map to show the Islands off Jaffna.

J. P. = Jaffna Peninsula. K. = Karaitivu. L. = Leyden M. = Mandaitivu.
E. = Eluvativu. A. = Analativu. N. = Nainativu. D. = Delft. I. = Iranétivu.
J. = Jaffna.

being nearly two miles in length and less than a half a mile in width at its widest region. It is entirely sandy with no cultivation either of paddy or cereals except for a tiny patch at its southern end. The whole island

abounds in palmyrah. The water in the few wells of the island is brackish and at the time of my visit the inhabitants were draining water from shallow pits dug on the shore. I was also informed that by the beginning of April water has to be brought to the island from Kayts. *Analativu* lies to the south-west of Eluvativu and is much longer, being nearly $2\frac{1}{2}$ miles in length and nearly a mile in breadth. Paddy cultivation is centred around the grey loamy soils of the central region of the island, whilst the sandy areas abound in palmyrah. Tracts of open country fringe the northern, southern, and western shores. Wells contain freshwater and at the time of my visit there were a large number of freshwater ponds and ditches. Between Eluvativu and Analativu is a small uninhabited island of low scrub. At the southern end of Analativu is another small island, *Puliantivu*. *Nainativu* is another small island, nearly $2\frac{1}{2}$ miles in length and about a mile in breadth. It lies to the west of Punkudutivu and at a distance of nearly 11 miles from Kayts as the crow flies. Paddy and tobacco cultivation is practised in the central region of the island, whilst the rest of the island is sandy. The western shore is open country. Freshwater wells and freshwater pools and ditches are found. There is also pipe-borne water along the main road from the Jetty. *Delft* is the furthestmost of the eight islands, and lies to the south-west of Nainativu, and Punkudutivu, about 16 miles from Kayts as the crow flies. It is nearly $5\frac{1}{2}$ miles from the island of Nainativu. It measures nearly 7 miles in length and about $3\frac{3}{4}$ miles in breadth at its widest region. It is perfectly flat. Paddy cultivation is practised in the western portion of the island, whilst in the remaining areas cereals are cultivated. In the northern part palmyrahs predominate, whilst the southern region is open country with low trees and scrub in the south-eastern area and open plains nearly surfaced with coral stones. Except for the lagoon no pools or ditches were seen at the time of my visit. Well water is brackish. The extent of the island is nearly 18 sq. miles (Lewis, 1909).

The following is a list of specimens collected from the islands during this tour:—

A. FISHES

1. Marine

- a. *Plotosus anguillaris* (Bloch). Off Leyden. A shoal of young about $1\frac{1}{2}$ inches in length were collected from near the shore. These were observed from time to time to swarm together and to swim out.
- b. *Tylosurus strongylurus* (Van Hasselt). Eluvativu. Dorsals I, 13. Anals I, 15. Pectorals I, 10. Ventrals I, 5. Total length 337 mm. One specimen.
- c. *Tylosurus giganteus* (Schlegel). Leyden. Dorsals 21. Anals. 18. Pectorals 14. Total length of largest specimen is 400 mm., of which the head length is 120 mm. Two specimens.
- d. *Hemirhamphus xanthopterus* Cuvier and Valenciennes. Leyden. Dorsals 16. Anals 15. Pectorals 13. Total length is 300 mm. One specimen.

- e. *Hemirhamphus far* (Forskål). Leyden. Dorsals 13. Anals 12. Pectorals 12. Total length is 398 mm. One specimen.
- f. *Liza dussumieri* (Valenciennes). Eluvativu. Dorsals IV, 8. Anals III, 9. Pectorals 16. One specimen.
- g. *Epinephelus tauvina* (Forskål). Eluvativu. Dorsals XI, 15. Anals III, 8. 5 vertical bands on body. Total length is 160 mm. One specimen.
- h. *Sillago sihama* (Forskål). Eluvativu. Dorsals XI, 22. Anals 26. Ventrals I, 5. Total length is 125 mm. One specimen.
- i. *Siganus javus* (Linné). Karaitivu. Dorsals XIII, 10. Anals VII, 9. Ventrals II, 3. Total length is 105 mm. One specimen.
- j. *Thysanophrys indicus* (Linné). Leyden. Collected at night close to the shore. Dorsals I, VII, 13. Anals 13. Total length of largest specimen is 144 mm. Two specimens.
- k. *Torquigener oblongus* (Bloch). Leyden. Collected at night close to the shore. Dorsals 12. Anals 10. Total length of largest specimen is 120 mm.
- l. *Chelonodon patoca* (Hamilton-Buchanan). Leyden. Dorsals 10. Anals 9. Immature specimens nearly 50 mm. in total length.

II. Brackish Water

- a. *Lepidocephalichthys thermalis* (Cuvier and Valenciennes). Leyden. Three V-shaped bands on caudal fin. Total length of largest specimen is 61 mm. Three specimens.
- b. *Macrones gulio* (Hamilton-Buchanan). Karaitivu and Punkudutivu. Total length of largest specimen is 113 mm. Four specimens.
- c. *Hemirhamphus gaimardi* Cuvier and Valenciennes. Immature specimens. Karaitivu and Leyden. Numerous specimens 38-76 mm. in total length.
- d. *Mugil speigleri* Bleeker. Karaitivu and Analativu. Total length of largest specimen is 98 mm. The specimen from Analativu was from a pool of freshwater.
- e. *Liza oligolepis* (Bleeker). Karaitivu. Height of body $3\frac{2}{3}$ inches in total length. Largest specimen is 51 mm.
- f. *Ambassis commersoni* Cuvier. Karaitivu. Dorsals VII, I, 10. Anals III, 10. Total length of largest specimen is 40 mm. Three specimens.
- g. *Therapon jarbua* (Forskål). Karaitivu. Dorsals XI, 10. Anals 8. One specimen.
- h. *Gerres oyena* (Forskål). Karaitivu and Leyden. Dorsals IX, 10. Anals III, 7. The 2nd dorsal spine 2 in. head length.

- i. *Scatophagus argus* (Linné). Karaitivu. Total length of largest specimen 59 mm. Four specimens.
- j. *Etoplus maculatus* (Bloch). Karaitivu and Leyden. Dorsals XVII-XVIII, 10-11. Anals XII-XIII, 8-9. Pectorals 14. Ventrals I, 5. Caudals 16. Depth of body $2\frac{2}{3}$ in. total length. Four specimens.
- k. *Glossogobius giuris* (Hamilton-Buchanan). Karaitivu. Total length 53 mm. One specimen.

B. AMPHIBIANS

- 1. *Rana tigrina crassa* Jerdon. Karaitivu and Leyden.
- 2. *Rana cyanophlyctis* Schneider. Karaitivu, Leyden, and Punkudutivu. Collected from both fresh and brackish water pools and ditches. It was observed that the body colour of those from the brackish-water pools and ditches was much paler and more yellowish than in those from fresh water. The dorsal blotches so conspicuous among those from the freshwater pools and ditches were hardly decipherable.
- 3. *Rana breviceps* Schneider. Leyden, Punkudutivu, Nainativu, and Delft.
- 4. *Rhacophorus leucomystax maculatus* (Gravenhorst). Punkudutivu, Analativu, Eluvativu, and Nainativu.
- 5. *Microhyla ornata* (Dum. & Bibr.). Leyden.
- 6. *Microhyla rubra* (Jerdon). Leyden, Analativu, and Nainativu.
- 7. *Bufo melanostictus* Schneider. Karaitivu, Leyden, Punkudutivu, Analativu, and Nainativu.
- 8. *Bufo fergusonii* Boulenger. Analativu.

C. REPTILES

- 1. *Melanochelys trijuga* (Schweigger). Nainativu.
- 2. *Lissemys punctata ceylonensis* (Gray). Leyden and Punkudutivu.
- 3. *Hemidactylus frenatus* Schlegel. Numerous on the palmyrah trees in all the islands, descending to the ground at night.
- 4. *Hemidactylus triedrus triedrus* Lesson. Eluvativu. Four specimens, two males and two females. Femoral pores 7/7 and separated by a single scale. The femoral pore counts from a number of specimens from the mainland of Ceylon are as follows: (a) 7/7 and separated by a single scale, Tunnakai (N.P.); (b) 12-13/12-13 and 17/15 and separated by three scales, Trincomallee (N.P.); (c) 17/16 and separated by three scales, Batticaloa (E.P.); (d) 17-18/11-17 and separated by three scales, Wellawaya (S.P.), and (e) 18/19 and separated by three scales, Gammaduwa (C.P.). It is evident that

the range of distribution of the *forma typica* appears to extend as far south as the northern province of Ceylon. It may even be that the Eluvativu and Tunnakai specimens belong to a new race but more information is necessary to elucidate this.

5. *Hemidactylus brooki parvimaculatus* Deraniyagala. Analativu.
6. *Hemidactylus leschenaulti* Dum. and Bibr. Nainativu and Delft.
7. *Calotes versicolor* Daudin. Rather scarce. Practically in all the islands.
8. *Sitana ponticeriana* Cuvier. Leyden. Young specimens, fairly numerous on the sand dunes on the western shore.
9. *Mabuya carinata* (Schneider). Karaitivu, Mandaitivu, and Delft.
10. *Riopa punctata* Gmelin. Nainativu and Delft. A specimen was collected along with three specimens of *Echis carinatus* under a fairly large coral stone in the open plains of Delft.
11. *Varanus bengalensis* (Daudin). Leyden.
12. *Ptyas mucosus* (Linnè). Karaitivu and Delft.
13. *Oligodon arnensis albiventer* (Günther). Analativu. Supralabials 7, 3rd, and 4th touching eye. Praeoculars 1. No loreal. Costals 17, 17, 17. Ventrals 172. Subcaudals 47. Anals 2. 18 black bands from neck to vent and 6 on tail with two incomplete bands.
14. *Dendrelaphis* sp. Analativu. Specimen seen only.
15. *Lycodon aulicus* (Linnè). Eluvativu. Collected at night from the sides of a well. Supralabials 9, 3rd, 4th, and 5th touching eye. Praeoculars 1. Loreals 1. Costals 17, 17, 17. Ventrals 189. Subcaudals divided and number 60. Anals 1.
16. *Dryocalamus nympha* (Daudin). Nainativu. Collected at night at the foot of a coco-nut tree and supposed to be numerous according to the inhabitants. Supralabials 7, 3rd, and 4th touching eye. Praeoculars 1. Loreals 1. Internasals 2. Costals 13, 13, 13. Ventrals 209. Subcaudals 77. Anals 2. 33 white bands on body between neck and vent and 22 on tail.
17. *Naja naja naja* Linnè. Analativu.
18. *Echis carinatus* Schneider. Mandaitivu, Punkudutivu, Nainativu and Delft.

D. BIRDS

1. *Butorides striatus javanicus* (Horsfield). Eluvativu.
2. *Ardeola grayii* (Sykes). Karaitivu, Leyden, Punkudutivu, Eluvativu, Analativu and Nainativu.

3. *Ardeola ibis coromanda* (Boddaert). Karaitivu, Punkudutivu, Analativu, and Nainativu.
4. *Nycticorax nycticorax nycticorax* (Linné). Karaitivu.
5. *Haliastur indus indus* (Boddaert). Karaitivu, Leyden, Mandaitivu, Eluvativu, Analativu, Nainativu and Delft.
6. *Accipiter badius badius* (Gmelin). Delft.
7. *Circus macrourus* (S. G. Gmelin). Delft.
8. *Circus aeruginosus aeruginosus* (Linné). Delft.
9. *Falco tinnunculus tinnunculus* Linnaeus. Leyden, Mandaitivu, Eluvativu, Analativu, and Nainativu.
10. *Francolinus pondicerianus ceylonensis* Whistler. Karaitivu, and Delft.
11. *Lobipluvia malabarica* (Boddaert). Delft.
12. *Pluvialis dominica fulva* (Gmelin). Leyden, Eluvativu, Analativu, and Delft.
13. *Charadrius dubius curonicus* Gmelin. Leyden, Mandaitivu, Punkudutivu, Eluvativu, Nainativu, and Delft.
14. *Charadrius alexandrinus seebohmi* Hartert & Jackson. Punkudutivu.
15. *Tringa glareola* Linnaeus. Delft.
16. *Actitis hypoleucos* (Linné). Eluvativu and Nainativu.
17. *Erolia temminckii* (Leisler). Mandaitivu.
18. *Erolia testacea* (Pallas). Analativu.
19. *Larus ichthyaetus* Pallas. Delft.
20. *Larus brunneicephalus* Jerdon. Leyden, Mandaitivu, and Punkudutivu.
21. *Chlidonias leucoptera* (Temminck). Leyden.
22. *Gelochelidon nilotica nilotica* (Gmelin). Leyden and Punkudutivu.
23. *Hydroprogne caspia caspia* (Pallas). Leyden.
24. *Sterna albifrons sinensis* Gmelin. Delft.
25. *Streptopelia chinensis ceylonensis* (Reichenbach). In all the islands.
26. *Psittacula krameri manillensis* (Bechstein). In all the islands.
27. *Clamator jacobinus jacobinus* (Boddaert). Delft.
28. *Clamator coromandus* (Linné). Leyden.

29. *Eudynamis scolopacea scolopacea* (Linné). Leyden and Analativu. A single female bird (juvenile) was collected from Analativu and its upper plumage was distinctly blacker with the feathers on the lores, cheeks and nape tipped rufous. Faint patches of rufous also seen on the wings and the tail feathers.
30. *Centropus sinensis parroti* Stresemann. Karaitivu and Leyden.
31. *Caprimulgus asiaticus eidos* Peters. Leyden.
32. *Collocalia brevirostris unicolor* (Jerdon). Karaitivu, Leyden, Eluvativu, Analativu, Nainativu, and Delft.
33. *Ceryle rudis leucomelanura* Reichenbach. Karaitivu, Leyden, and Analativu.
34. *Halcyon smyrnensis fusca* (Boddaert). Leyden, Eluvativu, Analativu, Nainativu, and Delft.
35. *Merops philippinus philippinus* Linnaeus. In all the islands.
36. *Merops orientalis ceylonicus* Whistler. Karaitivu, Eluvativu, Analativu, Nainativu, and Delft.
37. *Coracias benghalensis indica* Linnaeus. In all the islands.
38. *Upupa epops ceylonensis* Reichenbach. Karaitivu.
39. *Megalaima zeylanica zeylanica* (Gmelin). Karaitivu.
40. *Dinopium benghalense jaffnense* (Whistler). Karaitivu, Leyden, Eluvativu, and Analativu.
41. *Eremopterix grisea ceylonensis* Whistler. Nainativu and Delft.
42. *Anthus novaeseelandiae richardi* Vieillot. Mandaitivu and Delft.
43. *Anthus novaeseelandiae malayensis* Eyton. Karaitivu and Leyden.
44. *Pericrocotus peregrinus ceylonensis* Whistler and Kinnear. Punkudutivu and Analativu.
45. *Coracina novaehollandiae layardi* (Blyth). Punkudutivu.
46. *Artamus fuscus* Vieillot. Eluvativu, Analativu, Nainativu, and Delft.
47. *Pycnonotus cafer cafer* (Linné). Karaitivu, Leyden, and Delft.
48. *Pycnonotus luteolus insulae* Whistler and Kinnear. Punkudutivu.
49. *Saxicoloides fulicata fulicata* (Linné). Leyden and Mandaitivu.
50. *Copsychus saularis ceylonensis* Sclater. Karaitivu and Leyden.
51. *Orthotomus sutorius sutorius* (Pennant). Nainativu and Delft.
52. *Prinia inornata insularis* (Legge). Delft.

53. *Rhipidura aureola compressirostris* (Blyth). Nainativu, and Analativu.
54. *Nectarinia asiatica asiatica* (Latham). Punkudutivu, Eluvativu, and Delft.
55. *Nectarinia zeylonica zeylonica* (Linné). Karativu, Analativu, and Nainativu.
56. *Ploceus philippinus philippinus* (Linné). Delft.
57. *Lonchura malabarica* (Linné). Analativu and Delft.
58. *Passer domesticus soror* Ripley. Analativu.
59. *Sturnus pagodarum pagodarum* (Gmelin). Delft.
60. *Acridotheres tristis melanosternus* (Legge). Leyden, Mandaitivu, Eluvativu, Analativu, Nainativu, and Delft.
61. *Dicrurus macrocercus minor* Blyth. In all the islands.
62. *Corvus splendens protegatus* Madarasz. Leyden, Mandaitivu, Eluvativu, Analativu, Nainativu, and Delft.
63. *Corvus macrorhynchos culminatus* Sykes. Mandaitivu, Analativu, and Nainativu.

E. MAMMALS

1. *Tatera indica ceylonica* Wroughton. Leyden.
2. *Rattus rattus kandianus* Kellart. Analativu.
3. *Funambulus palmarum brodiei* (Blyth). Leyden and Delft.
4. *Herpestes flavidens maccarthiae* Gray. Delft.

DISCUSSION

No detailed information regarding the physical and climatic features of these islands is available and it is proposed, therefore, in view of their situation within a radius of twenty miles of Jaffna to consider the conditions occurring in the Jaffna Peninsula as the conditions likely to prevail over these islands.

Geologically the Jaffna Peninsula as well as the islands consist of a huge limestone block and the islands represent the submerged portion of the Peninsula (Cook, 1951, p. 330). It is of Miocene age belonging to the Kudremale-Jaffna series (Coates, 1935, p. 104) and of the calcareous facies (Adams, 1929, p. 443). The Peninsula as well as the islands are flat and low-lying with outcrops of limestone, especially in the northern parts of the Peninsula and in many of the islands especially Delft. The limestone in the Peninsula is highly fossiliferous, the fossils being mainly of foraminifera and mollusca. A. M. Davies who made a study of these fossils is of opinion that the Puttalam-Jaffna limestone series is of Pontian or Sahelian age, and that these rocks are identical with similar

rocks at Quilon in Travancore (Coates, 1935, p. 105). The thickness of the limestone in the Peninsula is unknown, but it is presumed to be some hundreds of feet deep. The limestone bed of the Peninsula is fairly level as it extends under the sea. Consequently, the sea water enters the underground circulation. The thick bed of porous limestone allows the water to percolate rapidly and the rain water being slightly acidic riddles the limestone with tiny holes. As a result the surface is left dry and all the water sinks below to circulate in these holes. Caverns and underground rivers are common and the wells in the Peninsula some distance away from the sea have salty water in them, and in other parts fresh-water springs occur on the shore. Practically the water in most of the wells in the island is also salty. At Leyden, Analativu, and Nainativu there were pools of fresh water at the time of my visit. The inhabitants of the island of Eluvativu were seen to drain off for drinking purposes the water collected in shallow pits near the shore. The conditions are much more severe in the islands than in the Peninsula, especially Eluvativu and Delft where there is so little fresh water that cultivation is extremely difficult and the inhabitants have always to drink coco-nut water and toddy (Cook, 1951, p. 137). Grey loams occur in the islands and, as in the Peninsula, these support paddy cultivation while the remaining parts are sandy, allowing the cultivation of cereals in favourable patches and the growth of the palmyrah palm. Cacti and thorny scrub predominate in the stretches of open country.

These islands in common with the northern and north-western tracts of the Peninsula come under the 'arid zone' with an annual rainfall of between 25"—50". 60% of the total rainfall occurs in the months of the north-east monsoon. The climate is marked by a 'single maximum rain "peak" in winter due to the strong NE. Monsoon dominance and with a marked "summer" dry season.' (Thambiahpillay, 1954, pp. 37 and 49). The average monthly rainfall as computed for 29 years from 1911-1940 (Thambiahpillay, 1954, XII, No. 4, p. 269) is as follows:—

Station	J	F	M	A	M	J	J	A	S	O	N	D
Jaffna	4.4"	1.5"	1.5"	2.2"	2.0"	0.4"	0.5"	1.1"	2.5"	9.2"	10.5"	10.4"

The average number of 'rainy days' for Jaffna as computed for 29 years, i.e. 1911-1940 (Thambiahpillay, 1954, XII, No. 4, p. 270) are as follows:—

Station	J	F	M	A	M	J	J	A	S	O	N	D
Jaffna	8	3	3	5	3	1	1	3	4	12	18	14

The number of days of drought for Jaffna are 223 for 1931 and 190 for 1932 (De Silva, S. F., 1936, p. 55).

The average rainfall for the western portion of the Peninsula and the islands is less than 10 inches during the months of the south-west monsoon. Rains begin usually in September. October to December are the wet months and by January sunny weather begins.

The average temperature over Jaffna and the islands is about 82°F. Jaffna shows a seasonal variation in temperature of 8°F. and shows also the highest rise in temperature in the months of March and April. This rise in temperature is presumed to be caused by the warm air over the Deccan exerting an influence. The smallest range of temperature occurs in the months of June and July, when the humidity of the air is 76-78%, and this accounts for this small range of variation. The highest range of variation occurs in the month of February, during which period the humidity of the air is the lowest being 66%. The Precipitation Index for Jaffna is 69.1 and the Temperature Efficiency is 147.

Sifting the above environmental features of the Peninsula and the islands the following factors may be considered to influence the animal populations inhabiting them :—

- a. the porous nature of the limestone composing the Peninsula and the islands, which allows the rain water to percolate rapidly leaving the surface dry ;
- b. the entry of sea water into the underground circulation, resulting in the water in most of the wells becoming salty ;
- c. the average rainfall being between 25-50 inches and 60% of the rainfall occurring in the months of October to December ;
- d. the average temperature being 82°F., the highest range being shown in the months of June and July ; and
- e. the number of days of drought being over 190.

It is evident, therefore, that the primary factor that controls the animal populations in the islands is the availability of fresh water and, consequently, the type of land animals inhabiting them must be able to withstand the long dry spell. It is very likely that during the rainy season there is an annual exodus of land animals from the Peninsula to the islands that are now connected with it, and in these they spread widely. But with the commencement of the dry spell those animals that took their abode near freshwater wells alone could survive, whilst the others would perish. As a result animals are everywhere scarce during the dry months in these islands. The common garden lizard, *Calotes versicolor*, so profusely met with in the mainland of Ceylon, is seldom seen, and I did not see more than six specimens during my sojourn in all the islands off Jaffna. All the temporary pools and ditches would be dry by April, and the specimens of *Rana tigrina crassa* and *Rana cyanophlyctis* living in them would perish. Therefore, the few land animals who are fortunate enough to establish themselves in the vicinity of freshwater wells would alone survive. In the islands of Analativu and Nainativu there is a small community of land animals living in close proximity to the wells and taps, either in holes and crevices or under heavy stones. The water used by the inhabitants for washing and bathing purposes keeps the ground near the wells moist, and at nightfall all these animals creep out of their shelters to hug the moist earth. At Analativu I saw specimens of *Rhacophorus leucomystax*, *Microhyla rubra*, and *Bufo melanostictus* around bathing wells, and at Nainativu specimens of *Rana breviceps*, *Rhacophorus leucomystax maculatus*, *Microhyla rubra*, *Bufo melanostictus*, and *Echis carinatus* around the water taps.

The absence of *Rana tigrina crassa* and *Rana cyanophlyctis* in those islands not connected with the Jaffna Peninsula, such as Eluvativu, Analativu, Nainativu, and Delft, indicates that these forms are unable to survive in them in the absence of permanent pools or wells of fresh water.

Both spend a good deal of their time in water and, even though a few of them could have got across to these islands through the agencies of launch and canoe, the absence of fresh water would have been detrimental to their survival, and the pioneers would have perished. At the same time *Rana cyanophlyctis* was collected from pools of brackish water, although it is considered to be essentially a freshwater form. In this respect it may be regarded to display some degree of 'ecological plasticity', which would have favoured their survival in the salty water of the wells in these islands. Either the water in the wells is too salty, thus precluding any amphibian life, or that the launch and canoe are not efficient means of dispersal may perhaps be the reason why *Rana tigrina crassa* and *Rana cyanophlyctis* are not found to occur in those islands not connected with the Peninsula.

In any discussion of an island fauna the effects of geographical isolation should find an important place. Till recently all these islands remained separate, and during this period geographic isolation was nearly complete except for any dispersal through the agency of the canoe. 'Isolation', according to Deraniyagala (1947, p. 76) 'first exerted a major influence upon Ceylon when the islands separated off the mainland of Asia during Miocene times. Extensive tracts especially to the north of Ceylon went under the sea to emerge subsequently to connect with the mainland.' The islands off Jaffna Peninsula therefore represent the submerged portion of the Peninsula which have been elevated subsequently. The island of Karaitivu lies at a distance of nearly two miles from the Peninsula and separated from Leyden by nearly half a mile. Mandaitivu is situated in close proximity to Leyden and Punkudutivu nearly $2\frac{1}{2}$ miles from Leyden. The island of Leyden lies nearly 2 miles from the Peninsula. All these islands mentioned above have been connected with one another and with the Peninsula during recent times by ferry and causeways. The islands of Eluvativu, Nainativu, and Delft remain separate even to this day. There is no doubt, therefore, that in all these islands the chief ecological barrier which restricted the 'flow of individuals from one population to another' was the stretch of water separating them. But with the construction of causeways and the inauguration of a ferry service these stretches of water have ceased to be an ecological barrier preventing animal dispersal. It is true that stretches of water do not serve as ecological barriers to the dispersal of most insects and birds, especially so when the distance concerned is so little. I have seen the butterfly *Polydorus hector* Linné and the Indian Edible Swift flying across over the sea from Leyden in the direction of Analativu, and a carpenter bee following our launch all the way from Nainativu to Kayts. But there is no doubt that water is an effective barrier in the case of land animals, and the only means of animal dispersal to these four islands, namely Eluvativu, Analativu, Nainativu, and Delft, must be through canoe and launch which ply between them.

The animals collected from the islands do not appear to display much variation in spite of such intensive geographic isolation, and most of them are identical with the Peninsular forms. The only specimens of interest are specimens of *Rana breviceps*, which appear to be diminutive with its dorsal body colour bluish green, and *Echis carinatus*, which displays a higher range of circumorbital scales. The specimens collected from the islands are all of south Indian stock. It is evident, therefore, that a more comprehensive collection is necessary to elucidate how far geographical

isolation has been accompanied by the development of biological isolating mechanisms.

Although detailed evidence is lacking it is necessary to make a passing reference as to how land animals in these islands tide over the long dry spell. I have seen a specimen of *Ptyas mucosus* at Delft hiding in a hollow of a tree nearly seven feet from the ground. I have collected three specimens of *Echis carinatus* and a specimen of *Riopa punctata* from under a large coral stone in the open plains of Delft. Four immature specimens of *Rana breviceps* were collected from under a coral stone near the drying lagoon, hiding themselves in a crab burrow. I have seen *Rhacophorus leucomystax maculatus* in enclosures on the ground near pipe connections. Close to these taps, in holes, crevices and under stones, I have collected specimens of *Bufo melanostictus* and *Echis carinatus*. I have also seen at Delft the mongoose hiding in caverns in large coralline rocks close to the shore. This should also be another aspect that should receive a closer study.

In conclusion I wish to compare this collection of zoological specimens with another collection from the island of Rameswaram made by Edgar Thurston (1895). I wish to comment upon the birds only. Of the 28 birds listed by him the following birds also occur in the islands off Jaffna: Kestrel, Shikra, Common Bee-eater, Goldenbacked Woodpecker, Pied Crested Cuckoo, Common Coucal, Indian Hoopoe, Black Drongo, Madras Redvented Bulbul, Magpie Robin, Jungle Crow, House Crow, Brahminy Myna, Spotted Dove, and Brownheaded Gull.

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